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Pesticide Fact Sheet Number 116: Parathion

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16. Abstract (Limit: 200 words)

This document contains up-to-date chemical information, including a summary of the Agency's regulatory position and rationale, on a specific pesticide or group of pesticides. A Fact Sheet is issued after one of the following actions has occurred.

1. Issuance or reissuance of a registration standard,
2. Issuance of each special review document,
3. Registration of a significantly changed use pattern,
4. Registration of a new chemical, or
5. An immediate need for information to resolve controversial issues relating to a specific chemical or use pattern.

17. Document Analysis a. Descriptors

Pesticides, regulations, Chemical Information Fact Sheet, Use Patterns, Science Findings

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

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United States
Environmental Protection
Agency

Office of Pesticides and Toxic Substances
Office of Pesticide Programs (TS-766C)
Washington, DC 20460

EPA

Pesticide Fact Sheet

Name of Chemical: PARATHION
Reason for Issuance: ISSUANCE OF GUIDANCE DOCUMENT
Date Issued: 12/1986
Fact Sheet Number: 116

1. DESCRIPTION OF CHEMICAL

Generic Name: O,O-diethyl-O-p-nitrophenyl phosphorothioate

Common Name: Parathion

Trade Names and other names: Alkron, Alleron, Aphamite, Bladan, Corothion, Ethyl Parathion, Folidol E-605, Fosferno 50, Niran, Orthophos, Panthion, Paramar, Paraphos, Parathene, Parawet, Phoskil, Rhodiatox, Soprathion, Stathion, Thiophos

EPA Shaughnessy Code: 057501

Chemical Abstracts Service (CAS) Number: 56-38-2

Year of Initial Registration: 1948

Pesticide Type: Insecticide

Chemical Family: Organophosphate

U.S. and Foreign Producers: Monsanto U.S.A.; Bayer A.G., West Germany; and Cheminova, Denmark

2. USE PATTERNS AND FORMULATIONS

Application Sites: Vegetable crops, field crops orchard crops ornamentals, aquatic crop and non-crop sites

Types of Formulations: Emulsifiable concentrates, granulars, dusts, baits, wettable powders and impregnated materials.

Types of Methods of Application: Ground applications; broadcast, band, and aerial application

Application Rates: 0.1 to 10.0 lbs/active ingredient per acre

Usual Carriers: petroleum solvents, clay carriers

3. SCIENCE FINDINGS

Summary Science Statement

Parathion is a Toxicity Category I organophosphate compound which is extremely toxic to laboratory mammals. The chemical has demonstrated adverse chronic effects such as tumors in the adrenal glands, retinal atrophy and degeneration, and degeneration of the sciatic nerve. The Agency has carried out a weight-of-the-evidence analysis and has concluded that parathion is a Category C oncogen (possible human carcinogen). Parathion was not shown to be teratogenic. Parathion is extremely toxic to fish and birds. Parathion is entering the Special Review process because of acute effects to both humans and birds. Human poisoning from parathion exposure have occurred during mixing/loading, application, early reentry into treated fields, equipment repair and hanling, and contact with spray drift.

Chemical Characteristics of the Technical Material

Physical State: Liquid
Color: Dark Brown
Odor: Garlic-like
Molecular weight and formula: 291.26 - $C_{10}H_{14}NO_5PS$
Boiling point: 157-162 at 0.6 mm Hg
Vapor Pressure: 0.42 u hg at 25' C (pure active ingredient)
Solubility in various solvents: Miscible in most all organic solvents and oils, only slightly soluble in water

Toxicology Characteristics

Acute toxicity: Parathion is extremely toxic to mammals by all routes of exposure and is classified in Toxicity Category I (1.75- 15.0 mg/kg). Additional acute toxicity tests have been waived because they would not alter this classification.

Major routes of exposure: Inhalation and dermal.

Delayed neurotoxicity: Data gap- To be filled via the published literature.

Oncogenicity: This chemical is classified as a Category C oncogen.

Chronic Effects: Retinal degeneration and sciatic nerve degeneration in life-time feeding studies in the rat.

Metabolism: Data gap.

Chronic Effects: Retinal and sciatic nerve damage at high dose levels was observed in the rat. Cholinesterase inhibition.

Teratogenicity: Parathion was not teratogenic at levels up to 1.5 and 16 mg/kg in the rat and rabbit, respectively

Reproduction: Data gap

Mutagenicity: Positive for induction of DNA repair in Unscheduled DNA Synthesis (UDS) assay in a human cells study. Additional genotoxicity studies are required to determine the mutagenic potential of parathion.

Physiological and Biochemical Characteristics

Mechanism of pesticidal action: This insecticide is active by contact, ingestion, and vapor action. Parathion in humans acts by causing irreversible inhibition of cholinesterase enzyme, allowing accumulation of acetylcholine at cholinergic neuroeffector junctions and autonomic ganglia. Poisoning also impairs the central nervous system function. Symptoms of poisoning include headaches, nausea, vomiting, cramps, weakness, blurred vision, pin-point pupils, tightness in chest, labored breathing, nervousness, sweating, watering of eyes, drooling or frothing of mouth and nose, muscle spasms, coma and death.

Environmental Characteristics

Available data provide insufficient information for the analysis of the environmental fate of parathion.

Parathion has little or no potential to contaminate ground water. This chemical was not included on the list of potential ground water contaminaters.

Ecological Characteristics

Avian oral toxicity: 1.3 mg/kg for house sparrows and pigeons

Avian dietary toxicity: 76 to 336 ppm for mallard and ring-necked pheasant, respectively

Avian reproduction: Data gap

Freshwater fish acute toxicity: 0.32 to 2.65 ppm for mosquitofish and channel catfish, respectively

Aquatic freshwater invertebrate toxicity: 0.04 to 5 ppb for most species

Marine and estuarine toxicity: 1.0 (48-hr) to 17.8 (96-hr) ppb for brown shrimp and striped bass, respectively

Endangered Species: Previous consultations with the Office of Endangered Species have resulted in jeopardy opinions and labeling for crops (alfalfa, apples, barley, corn, cotton, pears, and wheat), rangeland and pastureland, silvacultural sites, aquatic sites, and noncropland use. Labeling is being imposed to reduce the risk to endangered species.

4. Summary of Regulatory Position and Rationale

A. The Agency anticipates initiating a Special Review based upon its adverse acute effects to both humans and birds.

B. The Agency is requiring avian reproduction and terrestrial full field testing and simulated or full field aquatic testing to better define the extent of exposure and hazard to wildlife.

C. No new tolerances or new food uses will be considered until the Agency has received data sufficient to assess existing tolerances for parathion.

D. The Agency is concerned about the potential for human poisonings (cholinesterase inhibition) from the use of parathion. The Agency will continue to classify for restricted use (due to very high acute toxicity to humans and birds). The Certified applicator must be physically present during mixing, loading, equipment repair, and equipment cleaning. Information from the California Department of Food and Agriculture reported incidents of worker poisonings and illnesses during mixing, loading, and application. EPA is requiring more stringent "Worker Safety Rules", including protective clothing, to reduce exposure.

E. A reentry interval of 7 days is required for apple, citrus, peach, nectarine and grapes in the states of Arizona, California, Nevada, New Mexico, Oklahoma, Texas and Utah. A 48-hour reentry interval will remain on other crops and the crops listed above in all other states.

F. The Agency has classified parathion as a class C oncogen.

5. Required Unique Labeling Summary

All manufacturing-use and end-use parathion products must bear appropriate labeling as specified in 40 CFR 162.10. In addition, the following information must appear on the labeling:

All parathion products will continue to be classified for restricted use and the restricted use label will specify the reason (High acute toxicity to humans and birds).

A reentry interval of 7 days is required for apple, citrus, peach, nectarine and grapes in the states of Arizona, California, Nevada, New Mexico, Oklahoma, Texas and Utah.

A 48-hour reentry interval will remain on other crops and the crops listed above in all other states.

Additional labeling requirements are imposed to protect fish, birds and other wildlife, including endangered species.

Effluent containing parathion may not be discharged into lakes, streams, ponds, estuaries, oceans or public waters unless this product is specifically identified in an NPDES permit. Discharge of effluent containing this product is forbidden without prior notice to the sewage treatment plant authority.

Protective clothing requirements are being standardized to protect applicators, fieldworkers and mixer/loaders.

Human flaggers are prohibited during aerial application.

6. Tolerance Assessment

U.S., Canadian, Mexican, and Codex tolerances for negligible residues parathion in or on raw agricultural commodities can be reviewed on attachment I. U.S. parathion tolerances can also be found in 40 CFR 140.121.

Because of extensive data gaps in residue chemistry and toxicology areas, a tolerance assessment can not be made at this time. Plant and animal metabolites are required to be identified and their toxicological significance determined. Storage stability data are required, so some of the present tolerances may be affected. Sufficient data are available to ascertain the adequacy of the established tolerances for residues of parathion in or on the following raw agricultural commodities (RACs): beans (dried only), peas (dried and succulent), soybeans, mustard seed, safflower seed, sugarcane, and sugarcane forage.

There are no tolerances for residues of parathion in animal products. On receipt of the requested plant and animal metabolism data, the need for these tolerances will be determined.

Parathion's Acceptable Daily Intake (ADI) is 0.005 mg/kg/day, based on rat cholinesterase inhibition. The TMRC currently utilizes 192% of the ADI. Recent chronic feeding studies in rats strongly suggest that the present no effect level (NOEL) is not adequate and a new lower NOEL is needed. Additional data are required in order for the Agency to determine an adequate NOEL and ADI.

7. SUMMARY OF MAJOR DATA GAPS

' Animal and plant metabolism data
' Magnitude of the residues in various crops
' Full battery of Environmental Fate data

- Additional subchronic toxicity testing to determine a NOEL for cholinesterase inhibition and other systemic effects (retinal degeneration, sciatic nerve, abnormal gait)
- Reproduction studies
- Gene Mutation studies
- Reentry studies
- Avian reproduction and simulated field testing
- Acute toxicity to fresh water, estuarine and marine organisms
- Early life stage and fish life cycle studies
- Aquatic accumulation studies
- Glove permeability and drift studies
  Applicator Monitoring studies

7. CONTACT PERSON AT EPA

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DISCLAIMER: The information presented in this Chemical Information Fact Sheet is for informational purposes only and may not be used to fulfill data requirements for pesticide registration and reregistration.

ATTACHMENT I

Summary of Present Parathion Tolerances

Commodity	Tolerances (ppm) United States[a/]	Canada[a/]	Mexico[a/]	(MRL) International (Codex)[b]
Garden Beets	1.0	0.7	---	0.7
Carrots	1.0	0.7	---	---
*Parsnips	1.0	0.7	---	0.7
Potatoes	0.1	---	0.1	0.7
Radishes	1.0	0.7	1.0	0.7
Rutabagas	1.0	---	---	0.7
Sugar Beets	0.1	---	---	---
Sweet Potatoes	0.1	---	0.1	0.7
Turnips	1.0	0.7	---	0.7
Garlic	1.0	---	1.0	0.7
Onions	1.0	0.7	1.0	0.7
Celery	1.0	0.7	1.0	0.7
Endive	1.0	0.7	---	0.7
Lettuce	1.0	0.7	1.0	0.7
Spinach	1.0	0.7	1.0	0.7
Swiss Chard	1.0	0.7	---	0.7
Broccoli	1.0	0.7	1.0	0.7
Brussels Sprouts	1.0	0.7	---	0.7
Cabbage	1.0	0.7	---	0.7
Cauliflower	1.0	0.7	---	0.7
Collards	1.0	---	---	0.7
Kale	1.0	0.7	---	0.7
Kohlrabi	1.0	0.7	---	0.7
Mustard Greens	1.0	---	---	0.7
Beans	1.0	0.7	1.0	0.7
Peas	1.0	0.7	1.0	0.7
Soybeans	0.1	---	0.1	---
Eggplant	1.0	0.7	1.0	0.7
Peppers	1.0	0.7	1.0	0.7
Tomatoes	1.0	0.7	1.0	0.7
Cucumbers	1.0	0.7	1.0	0.7
Melons	1.0	1.0	1.0	0.5
Pumpkins	1.0	0.7	---	0.5
Squash	1.0	0.7	---	0.7
Citrus Fruits	1.0	1.0	1.0	1.0
Apples	1.0	1.0	1.0	0.5
Pears	1.0	1.0	1.0	0.5
Quince	1.0	1.0	---	0.5
Apricots	1.0	1.0	---	1.0
Cherries	1.0	1.0	---	0.5
Nectarines	1.0	---	---	0.5
Peaches	1.0	1.0	1.0	1.0
Plums	1.0	1.0	---	0.5
Blackberries		1.0	---	0.5
Blueberries	1.0	---	---	0.5

Summary of Present Parathion Tolerances (con't)

Commodity	Tolerances (ppm) United States[a/]	Canada[a/]	Mexico[a/]	(MRL) International (Codex)[b/]
Boysenberries	1.0	---	---	0.5
Cranberries	1.0	1.0	---	0.5
Currants	1.0	---	---	0.5
Dewberries	1.0	---	---	0.5
Gooseberries	1.0	1.0	---	0.5
Grapes	1.0	1.0	---	0.5
Loganberries	1.0	1.0	---	0.5
Raspberries	1.0	1.0	---	0.5
Strawberries	1.0	1.0	1.0	0.5
*Youngberries	1.0	---	---	0.5
Almonds	0.1	---	0.1	---
Filberts	0.1	---	0.1	---
Pecans	0.1	---	0.1	---
Walnuts	0.1	---	0.1	---
Barley	1.0	---	---	---
Corn	1.0	0.7	1.0	---
Oats	1.0	---	---	---
Rice	1.0	---	---	---
Sorghum	0.1	---	0.1	---
Wheat	1.0	---	---	---
Forage Grass	1.0	---	---	---
Alfalfa Forage	1.25	---	5.0	---
Alfalfa Hay	5.0	---	1.25	---
Clover Forage & Hay	1.0	---	---	---
Vetch Forage & Hay	1.0	---	---	---
Miscellaneous Crops				
Artichokes	1.0	---	1.0	0.7
Avocados	1.0	---	1.0	0.5
Cottonseed	0.75	---	0.75	---
Dates	1.0	---	---	0.5
Figs	1.0	---	1.0	0.5
*Guavas	1.0	---	1.0	0.5
Hops	1.0	1.0	---	---
Mangos	1.0	---	1.0	0.5
Mustard Seed	0.2	---	---	---
Okra	1.0	---	1.0	0.7
Olives	1.0	---	---	0.5
Peanuts	1.0	---	1.0	---
Pineapples	1.0	---	1.0	0.5
Rape Seed	0.2	---	---	---
Sugarcane	0.1	---	0.1	---
Sunflower Seed	0.2	---	---	---

a/ The U.S., Canadian, and Mexican tolerances are expressed in terms of residues of parathion per se.

b/ The Codex Maximum Residue Levels are expressed as residues of parathion and its oxygen analog, paraoxon.

* Although these crops have tolerance there are no EPA registered uses.